Math 212: Multivariable Calculus

Disclaimer

The information contained in this syllabus, other than the absence policy, are subject to change with reasonable advance notice.

Course Information

Course Logistics

Class time	:	Monday, Wednesday, Friday, 09h00 – 09h50
Class room	:	George R. Brown (GRB) W212 (2F)
Office hours	:	Friday, Sunday, 16h00 – 17h30, Humanities (HUM) 118 (1F)
TA sessions	:	Tuesday, Thursday, 19h00 – 21h00, Abercrombie Labs (AEL) B209 (2F) Wednesday, 19h00 – 21h00, Herring (HRG) 129 (1F)

Instructor Information

Instructor	:	Stephen Wolff
Office	:	HBH 038 (basement)
E-mail	:	Stephen.Wolff@rice.edu

Textbook

The textbook for this course is *Calculus: early transcendentals*, by James Stewart.

You should feel free to procure any edition of Stewart's textbook covering the following chapters (chapter numbers refer to the 6th edition, which I use):

12. Vectors and the geometry of space
13. Vector functions
14. Partial derivatives
15. Multiple integrals
16. Vector calculus

Editions as far back as the 5th edition contain almost exactly the same sections in these chapters. I haven't conducted exhaustive research on each edition, but I conjecture that they are very similar.

I will type and share the exercises for each assignment, so you needn't worry about exercise numbers being different if you purchase an older edition.

This course will not require online submissions via the textbook's access-controlled site, so you needn't worry about valid codes.

Two final remarks regarding Stewart's textbook:

1. Stewart's textbook is sometimes sold in halves. If you purchase half the textbook, make sure it is the second half, titled "Multivariable calculus".

2. The "early transcendentals" subtitle to the book is irrelevant to the chapters we will cover. (It pertains to when transcendental functions are introduced in the earlier chapters. To read more about this (pedagogical) distinction, visit [1], [2], [3].)

Grading Policy

Grades will be based on the following four metrics.

1. Homework (H). There will be homework assigned daily. Homework is due promptly by 09h05 the following class. Late homework will not be accepted. Homework will be graded using a "reasonable completion" rubric. Your lowest five homework scores will be dropped.

2. Quizzes (Q). There will be an in-class quiz every day at 9h00 sharp. Quizzes come in two flavors: reading quizzes (RQ) and exercise quizzes (EQ). Reading quizzes are short 1- or 2-minute quizzes on key content in the assigned reading (pre-reading incentive). Exercise quizzes are longer 5- to 15-minute quizzes asking you to solve an exercise (exam practice). Quizzes are weighted as follows:

$$\mathrm{Q} = 50\% \times \mathrm{RQ} + 50\% \times \mathrm{EQ}.$$

   Make-up quizzes will not be given. Your lowest five RQ scores and lowest three EQ scores will be dropped.

3. Exams (E). There will be three exams. Exams are weighted as follows:

$$\mathrm{E} = 30\% \times \mathrm{E}_1 + 30\% \times \mathrm{E}_2 + 40\% \times \mathrm{E}_3.$$

   All exams will be cumulative. See page 4 for the exam dates.

4. LaTeX (L). There will be one short typesetting assignment. Essentially, you will type up your solution to a homework or quiz exercise. I will provide a template and typesetting assistance.

Your grade will be the maximum of the following weighted averages:

$$\begin{aligned}
\text{Average 1} &= 20\% \times \mathrm{H} + 20\% \times \mathrm{Q} + 55\% \times \mathrm{E} + 5\% \times \mathrm{L} \\
\text{Average 2} &= 20\% \times \mathrm{H} \qquad\qquad + 75\% \times \mathrm{E} + 5\% \times \mathrm{L} \\
\text{Average 3} &= \qquad\qquad 20\% \times \mathrm{Q} + 75\% \times \mathrm{E} + 5\% \times \mathrm{L} \\
\text{Average 4} &= \qquad\qquad\qquad\qquad 95\% \times \mathrm{E} + 5\% \times \mathrm{L}
\end{aligned}$$

Caveat discipulus: Regarding grades, homework is easy points. Quizzes are usually easier than exams. Both homework and quizzes are meant to train you for optimal performance on exams (and after). If Average 4 is your highest average, then your average is probably in trouble.

Absence Policy

Class attendance is strongly encouraged but not required. We are old enough to accept responsibility for our actions and decisions.

Rice Honor Code

As a student at Rice University, you pledge to uphold the Rice Honor Code, which you can find in the Honor System Handbook.

On homework, all resources are permitted. In particular, you are strongly encouraged to work with one another. The purpose of homework is to help you to learn and internalize the material.

On quizzes and exams, no external resources are permitted, unless the instructor explicitly indicates otherwise. The purpose of quizzes and exams is to show that you have internalized the material.

Students with Disabilities

Any student with a documented disability that requires accommodation is encouraged to contact both the course instructor and Disability Support Services (adarice@rice.edu; Allen Center, Room 111).

Course Objectives and Expected Learning Outcomes

By the end of this course, you should know how to

- Describe the geometry of euclidean space $\mathbf{R}^n$, particularly $\mathbf{R}^2$ and $\mathbf{R}^3$
- Work fluently with vector-valued functions
- Compute partial derivatives and directional derivatives
- Optimize in $\mathbf{R}^n$ (including the method of Lagrange multipliers)
- Compute iterated integrals in rectangular, polar, cylindrical, spherical coordinates
- Perform a change of variables (with application to multiple integrals, including computation of the Jacobian matrix and determinant)
- Compute line integrals of scalar- and vector-valued functions
- Use div, grad, and curl, and have a (physical) sense of what they measure
- Parametrize surfaces and compute surface integrals
- Use a few fancy theorems (Green's, Stokes's, and the divergence theorem)
- Typeset basic documents using LaTeX

Calendar

Following is a preliminary schedule of topics. Section numbers refer to the 6th edition unless indicated otherwise (e.g., 8e refers to the 8th edition). Exercise numbers refer to the "Exercises" document (NOT Stewart's numbering!). Exercises are *assigned* on the date of the line on which they appear and are *due* the following class.

Day	Date	Topics	Sections	Exercises
M	22 Aug	Diagnostic quiz		
W	24 Aug	Coordinate systems; Vectors	12.1,12.2	12.1.2,3,4,5,8;12.2.2,3,4
F	26 Aug	Inner product; Cross product	12.3,12.4	12.3.1,4,5,7,11;12.4.2,3,5,8
M	29 Aug	Lines, planes	12.5	12.5.1,3,5
W	31 Aug	Cylinders, quadric surfaces	12.6	12.6.1,2,3
F	02 Sep	Vector-valued functions	13.1,13.2	13.1.1,2,3;13.2.1,2
M	*05 Sep*	*University holiday — no class*		
W	07 Sep	Derivatives and integrals	13.2,13.3	13.2.5,6;13.3.1
F	09 Sep	Arc length; Velocity, acceleration	13.3,13.4	13.3.2;13.4.1,2,3
M	12 Sep	Functions on $\mathbf{R}^n$	13.4,14.1	14.1.1,3,4,6
W	14 Sep	Limits, continuity	14.1,14.2	14.1.8;14.2.1,2,3,5
F	16 Sep	Partial derivatives	14.3	14.3.1,2,3,6,8,10
M	19 Sep	Linear approximation	14.4	14.4.1,3,4,6
W	21 Sep	Chain rule	14.5	14.5.1,3,5,7
F	23 Sep	Directional derivative, gradient	14.6	14.6.2,5,6,7,8,10
M	26 Sep	Optimization	14.7	14.7.1,3
W	28 Sep	Review	12.1–14.7	Mock Exam 1 (Fall 2016)
R	**29 Sep**	**Midterm exam 1**	**12.1–14.6**	
F	30 Sep	Lagrange multipliers	14.8	14.7.5,7,8;14.8.1,2,6
M	03 Oct	Double integrals	15.1,15.2	15.1.1,2;15.2.1,3
W	05 Oct	Iterated integrals	15.2,15.3	15.2.5,6,7;15.3.2
F	07 Oct	Double integrals over general regions	15.3	15.3.4,6,7,8
M	*10 Oct*	*University holiday — no class*		
W	12 Oct	Polar coordinates	15.4	15.4.1,2,3,4
F	14 Oct	Applications	15.5	15.5.1,3
M	17 Oct	Surface area of graphs	16.6 (6e),15.5 (8e)	16.6.7,9
W	19 Oct	Triple integrals	15.6	15.6.1,4,5
F	21 Oct	Cylindrical, spherical coordinates	15.7,15.8	15.7.2,3,4
M	24 Oct	Cylindrical, spherical coordinates	15.7,15.8	15.8.2,3,5
W	26 Oct	Change of variables	15.9	15.9.1,2
F	28 Oct	Change of variables	15.9	15.9.3,4,5
M	31 Oct	Vector fields	16.1	16.1.1,2,3,4
W	02 Nov	Line integrals	16.2	16.2.1,2,3
F	04 Nov	Fundamental theorem	16.2,16.3	16.2.4;16.3.1,3,4
M	07 Nov	Green's theorem	16.3,16.4	16.3.6,8;16.4.1
W	09 Nov	Review	12.1–16.4	Mock Exam 2 (Fall 2016)
R	**10 Nov**	**Midterm exam 2**	**12.1–16.4**	
F	11 Nov	Green's theorem	16.4	16.4.2,3,5,6
M	14 Nov	Curl, divergence	16.5	16.5.1,2,3,5
W	16 Nov	Parametric surfaces	16.6	16.6.2,3,5
F	18 Nov	Surface integrals	16.6,16.7	16.6.6,8;16.7.1
M	21 Nov	Surface integrals	16.7	16.7.3,5
W	23 Nov	Stokes's, divergence theorem	16.8,16.9	16.8.1,4;16.9.1,4
F	*25 Nov*	*University holiday — no class*		
M	28 Nov	Stokes's, divergence theorem	16.8,16.9	16.8.2;16.9.2
W	30 Nov	Review	All	Mock Exam 3 (Fall 2016)
F	02 Dec	Review	All	
TBA	**TBA**	**Final exam**	**12.1–16.10**	